

What is claimed is

1. A membrane device for receiving a feedstock at a feed end face and for separating the feedstock into a gas-phase permeate and retentate, comprising:
  - a membrane support containing at least one monolith of porous material defining a plurality of passageways, with passageway wall surfaces, extending longitudinally from the feed end face of the monolith to a retentate end face of the monolith through which the feedstock flows to pass retentate from the device;
  - a permselective membrane coating applied to the passageway wall surfaces;
  - at least one permeate conduit formed within the monolith, the conduit containing a plurality of longitudinal permeate chambers transected by permeate channels, the channels providing a means for introduction of a sweep fluid into the permeate chambers and withdrawal of the sweep fluid and gas-phase permeate from the permeate chambers;
  - and
  - a means of separating the sweep fluid and gas-phase permeate flows from the feed and retentate flows.
2. The device of claim 1 in which the membrane support is a single monolith.
3. The device of claim 1 in which the membrane support is a plurality of monolith segments.
4. The device of claim 1 in which the permeate channels are located at or near the end faces of the monolith.
5. The device of claim 4 in which the permeate channels are slots at the end faces of the monolith and are sealed to isolate the permeate chambers from feed and retentate.

6. The device of claim 1 in which the means of sweep fluid introduction and withdrawal are channels which communicate with an annular space between the membrane device and a permeate collection housing.

7. The device of claim 1 in which the means of sweep fluid introduction and withdrawal are ducts at the feed end face and the retentate end face, respectively.

8. A method of separating a feedstock in a membrane device into a gas-phase permeate and retentate, which method comprises:

- a) providing a crossflow membrane device of claim 1 contained within a permeate collection housing and means for separating gas-phase permeate from feedstock and retentate flows;
- b) introducing a feedstock into the feed end face of the device and into a plurality of the device passageways for separation into a gas-phase permeate and retentate;
- c) removing the retentate from the retentate end face of the device; and
- d) introducing a sweep fluid into the permeate conduit of the device and removing the sweep fluid and gas-phase permeate from the permeate conduit of the device.